Statistical Inference

Worksheet 4:

1. The length of parts manufactured by a certain machine has a normal distribution of mean 20cm and standard deviation 0.25cm, when the machine is working properly. The length of 18 pieces manufactured by this machine, chosen at random, was measured and the following values were recorded (in cm):

20.17	19.92	20.71	19.91	20.21	20.11	19.31	19.76	19.85
19.69	19.83	19.51	19.81	20.38	18.99	20.31	20.18	20.42

   Test the hypothesis that the machine is working correctly.

2. Consider the following sample of dimension 20:

0.790	0.522	0.003	0.351	0.175	0.628	0.389	0.094	0.113	0.638
0.306	0.133	0.046	0.961	0.345	0.527	0.939	0.763	0.177	0.657

   Use the Komogorov-Smirnov test to test the hypothesis that this sample comes from a population with a uniform distribution over [0,1].

3. Test the hypothesis H_0: The sample comes from a normal distribution, for the following sample:

189.2	195.5	194.0	185.3	185.4	184.8	182.5	198.4	184.4
171.7	171.7	183.3	188.5	175.2	179.0	172.4	198.9	175.9

4. Based on sample problem 2:

   (a) Build a trust band for population distribution, F, with 90% confidence.

   (b) Use Wilcoxon test to test $H_0 : \text{med} = .5$ against $H_1 : \text{med} \neq .5$.

   (c) Construct a confidence interval for the quantile of order .2.

5. Intended to replace the XS model of tyres, a test is being carried out with a new model of tires in a factory. It is known that the median duration of XS tires is 42000km and, in a first study, we intend to compare the two models with respect to lifespan.

   (a) What are the appropriate H_0 and H_1 hypotheses?

   (b) What does the test level represent in this problem?

(c) A test was carried out with a sample of 10 tires of the new model, recording the following durations (in thousands of km):

43 47 41 49 39 40 48 44 45 38

From this data, compare the two models with a level of 0.01.

6. A group of 4 coins is tossed 160 times, with the following results:

number of faces	0	1	2	3	4
frequency	16	48	55	33	8

Are the coins be balanced?

7. The table below represents the total number of requests per week for replacement of one or more parts of television sets, registered during a period of 50 weeks.

number of orders	0	1	2	3	more than 3
number of weeks	28	15	6	1	0

Test if the Poisson distribution provided a good fit to the data above.